Summer 1953

South Dakota Farm and Home Research

Agricultural Experiment Station

SOUTH DAKOTA

FARM and HOME Research

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A REPORT OF PROGRESS

Vol. iV SUMMER, 1953 No. 4

In This Issue

Our Cover

The young lady in the picture was as golden brown as the field of rye she was standing in. She is the former Beverly Rude, now Mrs. Richard Craddock. The rye is the Station's Pierre rye, the most winter-hardy rye known, and as beautiful a field as you would want to see. Our agronomists tell us that rye is one of the surest producing crops under South Dakota conditions. It is an excellent weed "fighter," makes good pasture, and also acts as a winter cover crop.

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SOUTH DAKOTA STATE COLLEGE
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MARJORIE KING, *EDITOR*

SOUTH DAKOTA FARM AND HOME RESEARCH will be sent free to any resident of South Dakota in response to a written request to the editor, Agricultural Experiment Station, South Dakota State College, Brookings, S. D.

Dear Folks:

State College has announced Thursday and Friday, October 1 and 2 as *Farm and Home* days. The first day's program will deal with the subject of "the American farmer and his farm program," and will include the eminent farmers' and homemakers' banquet. On the second day, there will be the dedication of the new Agricultural Hall. We hope you will keep these dates in mind and arrange to attend the events.

A new and extensive program of research on grass silage is underway at the Station which you will be interested in. Because grassland farming and diversification are of increasing interest, more farmers each season have been inquiring about the best and most economical methods of storing and feeding grass silage.

This past year the Animal Husbandry and the Dairy departments of the State Experiment Station started research on stacking grass-legume silage, using it as a feed for sheep and dairy cattle. The results were encouraging, and now this research, with the cooperation of five additional Station departments and the Extension Service, is being further developed.

All angles of the problem are being attacked. These will include six different methods of storing, the possibilities of self-feeding, the bulk losses encountered in various methods of storing, chemical analysis of nutrients, digestive trials, changes in the microflora occurring during the ensiling process, incidence of bloat, production records of cattle fed from the silage stored, and finally, a survey of the farming area to determine the types of silos now in use, and their advantages and disadvantages.

We hope to have much to tell you about these developments in the near future.

Sincerely,

I. B. Johnson

Director

Forage Crops FOR TURKEYS

By Wm. Kohlmeyer *and*
C. W. Carlson

Turkeys grown on a range that supplies good forage require less grain and concentrated feed than those grown in confinement or in an "exercise lot."Experience has shown that from 10 to 20 percent less feed may be required for the period of 10 weeks of age to market time, if good green range is available. This can result in a sizeable cut in the feed bill.

It is a common recommendation that one acre of range be allowed for each 100 turkeys grown. If heavy breed turkeys are placed on range when they are 10 weeks old and are sold at 26 weeks of age, they may be expected to consume about 65 pounds of grain and mash per bird during the range period, or 6500 pounds per 100 birds. When good range reduces food requirements by 10 percent, feed saved per 100 birds would be 650 pounds. If the reduction reaches 20 percent, one could save 1300 pounds of feed per 100 birds. On this basis, estimating the average cost of the feed saved at only 4 cents per pound, an acre of good range could save the turkey grower feed worth from $26 to $52. This would be considered good annual cash rent for South Dakota farm land, even though allowances are made for seed costs and other minor expenses.

Succulent green pasture is recognized as an excellent source of both fat-soluble and water-soluble vitamins. It also provides appreciable amounts of protein and minerals. When turkeys are kept on land not used for poultry for the previous two years, and are moved to a new location on such land regularly, protection against soil-borne diseases

and parasites is provided. Crops which provide a dense sod reduce the opportunities for direct contact with the soil, when compared with crops that have little sod-forming ability. Cannibalism and feather-picking are far less troublesome in flocks provided with good range than in flocks grown in confinement or on poor range. Sound use of good range can reduce feed costs and disease hazards in raising turkeys.

Desirable forage crops for turkeys should provide young, new growth during the time the birds are from 10 to 26 weeks of age. Date of hatching determines the period when forage requirements will be greatest. Turkeys hatched April 15 would be ready for the range on or about the first of July. Their greatest use of forage would come during July, August, and September. These are months of high temperatures and low rainfall in South Dakota. Many of our common pasture grasses make but very little new growth during these months.

For several years, turkey feeding trials have been conducted at the North Central Substation at Eureka using a variety of crops as forage. Under each heading are given the observations made when the different crops were used for turkeys.

Proso Millet

This was used both for summer forage and for grain to be harvested by the turkeys. When drilled in a solid stand it was fairly good. However, as the season advanced, there was a tendency for birds to clean it up as they went rather than feed over the entire plot. When the proso was allowed to mature before the turkeys were moved in, the birds did a good job of stripping out the seed, but there was considerable loss due to lodging and shattering. Proso does not stand and hold its seed long enough after it ripens to be most useful from this standpoint.

Sorghum and Milo

Several varieties have been tried. They made good growth in spite of low moisture supplies and hot weather. They would seem to be most useful when permitted to mature seed which turkeys can harvest. Some years early frosts stopped growth before the seed had matured. Even with short-stemmed varieties, it was usually necessary to break over some of the stalks in order to get the turkeys to start eating the seed. With taller growing types, it may be necessary to break down practically all of the sorghum as additional supplies are needed. This can be done by driving down the rows with a truck or tractor.

Rape

This has been one of the most useful forage crops tried so far. The seed is not expensive and it is not hard to get a stand in the more humid areas. Rape may be seeded alone, or combined with a light seeding of oats. It starts quickly and has ability to come back after being heavily pastured. Turkeys like rape and will eat it down to stumps if the supply is not plentiful. Rape does not form a sod. It is an annual crop that can be seeded and pastured the same year. Some turkey growers include a light seeding of rape in their small grain. After the grain has been harvested, the

rape will make sufficient growth to provide good fall pasture. Rape will continue to grow in the fall of the year until hard freezes occur.

Sudan Grass

This grass has made a lot of forage during hot weather. Since it is usually seeded late in the growing season, and since it requires high temperatures, it cannot be depended upon to furnish much pasturage until after mid-July. Like some other crops that grow rather tall, it may require some clipping to keep the new growth at a height that can be reached by the turkeys. When Sudan grass was allowed to grow tall, the turkeys did not range over more than a small area close to the shelters and feeders.

Sunflowers

Small, experimental plantings have been tried of a short-stemmed, combine-type of sunflowers. They were planted in rows and were cultivated like corn. Under these conditions sunflowers did not produce much usable forage. A good seed crop was produced and it might have been a feed saver if the turkeys had actually consumed the seed. When the sunflower seed approached maturity, multitudes of wild blackbirds descended upon the plantings and succeeded in harvesting the seed before the turkeys were able to use much of it. Various methods were used to try to discourage the blackbirds. None were successful.

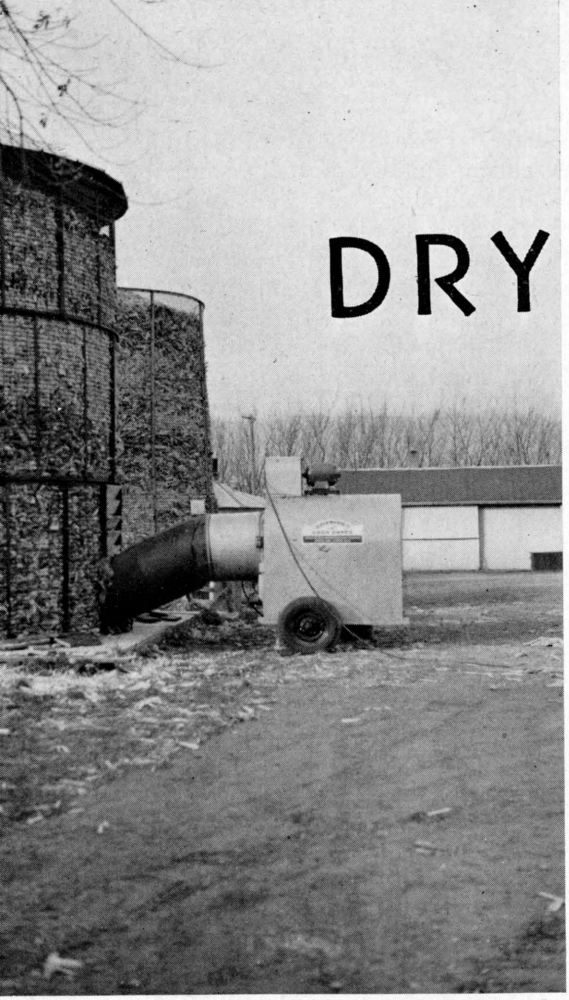
Alfalfa

This perennial crop must be seeded at least a year before it is ready for use. It has furnished an excellent quality of forage and it stands clipping very well. In dry, hot seasons it failed to make a great amount of new, fresh growth during August and September. The cost of seed may be high at times, and it is not always easy to get a good stand. Unless one uses very early hatched turkeys, it should be possible to get a crop of hay from alfalfa before the turkeys will be ready for the range.

Other Crops Offer Possibilities

Crops which have not yet been tested at the North Central Substation, but which may offer possibilities for some sections of South Dakota, would include Birdsfoot trefoil and Ladino clover. These are perennial legumes that would seem to hold promise where moisture supplies are adequate and where severe winter-killing is not an excessive hazard. Reports thus far would indicate that Ladino may not be successful except in the southeastern part of the state. Birdsfoot trefoil has been grown on such a limited scale thus far that its potential territory is not yet established. Creeping alfalfa offers interesting possibilities, but a shortage of seed supplies will probably limit trials of it for some time.

The search continues for a forage crop or crops that will most effectively meet the need of turkey growers. Such experience should aid the grower to reduce the costs of producing turkeys and thus improve his position in our agricultural economy. (Project 79. Leaders: Wm. Kohlmeyer, C. W. Carlson, Poultry Dept.)



A 1700-bushel crib of corn being dried by heated air in an engineering experiment.

DRYING THE Corn Crop

By H. H. DeLong

Drying corn, either on the ear or shelled right from the field picker sheller, is a practice which is becoming more common in South Dakota. The fact that seasonal changes vary greatly and are unpredictable, makes the need for drying equipment urgent in some years and quite unnecessary in others. To furnish reliable information to farmers interested in grain drying, the Agricultural Engineering department undertook investigations on types of drying equipment, and on three methods of drying: (1) open crib drying, (2) forced cold air drying, and (3) forced heated air drying.

Since the moisture content of corn affects its market grade and selling price, the farmer may realize a greater return by drying his high moisture corn. The proper moisture content for shelled corn in storage has long been recognized: 13 percent moisture content is considered a safe figure, but for long-time storage and assurance against both mold and insect damage, 12 percent is sometimes desirable. Ear corn of 18 percent moisture is safe for storage in slatted cribs.

Drying corn below 14 percent moisture for marketing may penalize the producer by reducing the marketed weight without increasing the grade or price. U. S. grain grades for corn, with respect to moisture content, are as follows:

No. 1—14 percent; No. 2—15.5; No. 3—17.5; No. 4—20 percent. There are, of course, other requirements for the U. S. grades of corn in addition to given moisture content.

Determining Moisture Content

Moisture content is commonly defined in terms of the original sample weight or "wet weight." After drying, a sample is then defined in terms of a new "'wet weight." An illustration of this is given in Fig. 1 which shows the percentage of moisture in the original sample, the moisture removed, and the moisture remaining to give 14 percent of the new sample.

There are some basic principles in drying grain that will help make the process clearer to the farmer who is interested in drying his corn. For instance, all grain may release moisture to the air or absorb it from the air. At a given temperature the aid and grain will reach a hygroscopic (moisture) balance. Knowing this, the farmer will not let his drier run on a wet day or he will have wetter corn than he had to begin with, particularly if he is using cold air drying. (See Table 1.)

Fig. 1. Moisture relation to dry matter in corn

Using the graph above, you can find the weight of corn you will have left after drying the corn down to 14 percent moisture. If you had a 100-pound sample of corn with 20 percent moisture, you would need to remove about 6.6 pounds of water to have a new sample of 14 percent moisture weighing 93.4 pounds, with a dry matter weight of 80 pounds. (For 10,000 pounds of corn, multipy the results by 100.) *Editor's note:* Don't let those figures on top of the columns confuse you. Our agricultural engineers explained them this way: In the same column, (20 percent moisture) it says at the top of the column that if 6.6 pounds of water are removed, 13.3 pounds of the original moisture is left to equal 14 percent of the new sample.

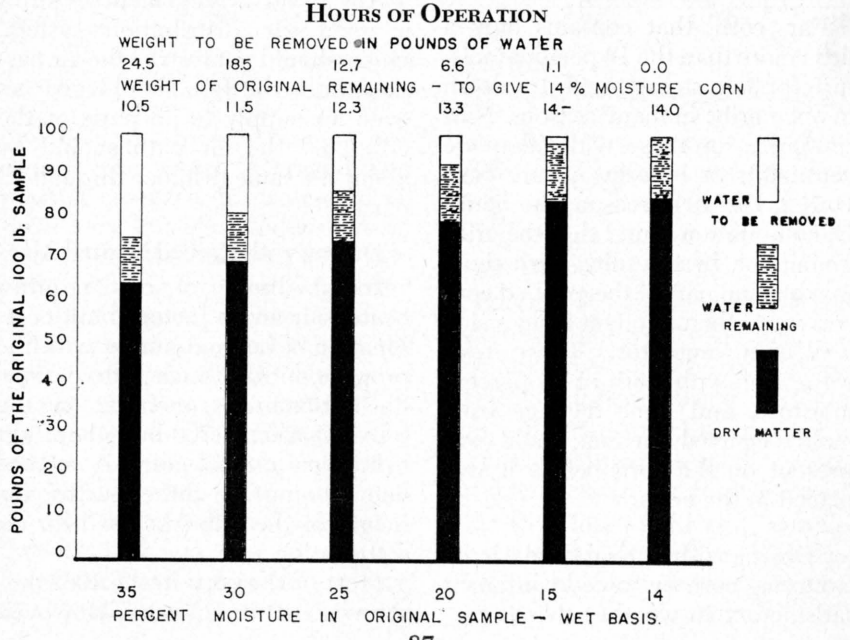


Table 1. Adsorbed Moisture Equilibrium for Shelled Yellow Dent Corn with Air at Various Humidities (77° F.)*

Relative humidity	15	30	45	60	75	90	100
Moisture content, %	6.43	8.39	10.47	12.93	14.78	19.06	23.78

*From Coleman and fellows, USDA.

Note that air at 77 degrees and 75 percent relative humidity will not dry corn below the 15 percent moisture content. In fact, corn that is drier than 15 percent will again take on moisture from the air. This situation is further complicated by the fact that molds grow on grains when the surrounding air is at 75 percent relative humidity, or above.

Cold air will hold, or carry very little moisture, but warm air will carry relatively large amounts. To take the guesswork out of drying corn, the farmer may be interested in consulting a psychrometric chart, or in looking up the equivalent information in tables.

Crib Drying

Ear corn that contains only a little more than the 18 percent moisture for safe storage will dry down in open cribs in many seasons. Narrow cribs, or those with adequate ventilators or breezeways are best. During the 1945 season, the South Dakota Station found that the cribs giving the best results were those in which no part of the cribbed corn was more than two feet from a side wall or a ventilator. These tests were run with corn of 30 percent moisture, and some damage from mold occurred; in fact, mold was present on the corn before it was placed in the cribs.

Drying with Forced Cold Air

Drying corn by forced cold air is satisfactory in weather that is reasonably warm and dry. Early corn harvest may allow favorable drying time in late October and in part of November. Blowing cold air through the corn will do little if any drying. However, to check heating and molding of grain, it may be expedient to force cold air through it to cool it down, even below the freezing point. The fan should not be operated in rainy weather.

The process of drying with cold air is a slow one, and the installation of fan and electric motor should be such that it can be left to operate with a minimum of the operator's time. The cold air fan and motor are less expensive than the heater dryer.

Any dryer arrangement requires a good air distribution system. Ducts should not restrict the air passage from the fan, should give an even air supply to all parts of the crib, and the air path should be about the same distance through all parts.

Drying with Forced Heated Air

Rapid drying of corn requires heated air and a factory-built combination of fan and burner with the proper controls. Such a dryer (see illustration) was operated in the fall of 1952 on a 1700-bushel upright cylindrical crib of corn. A vertical flue running up three-fourths the height of the crib was used for air distribution.

Most of the corn in the 1952 season was mature and dry. However,

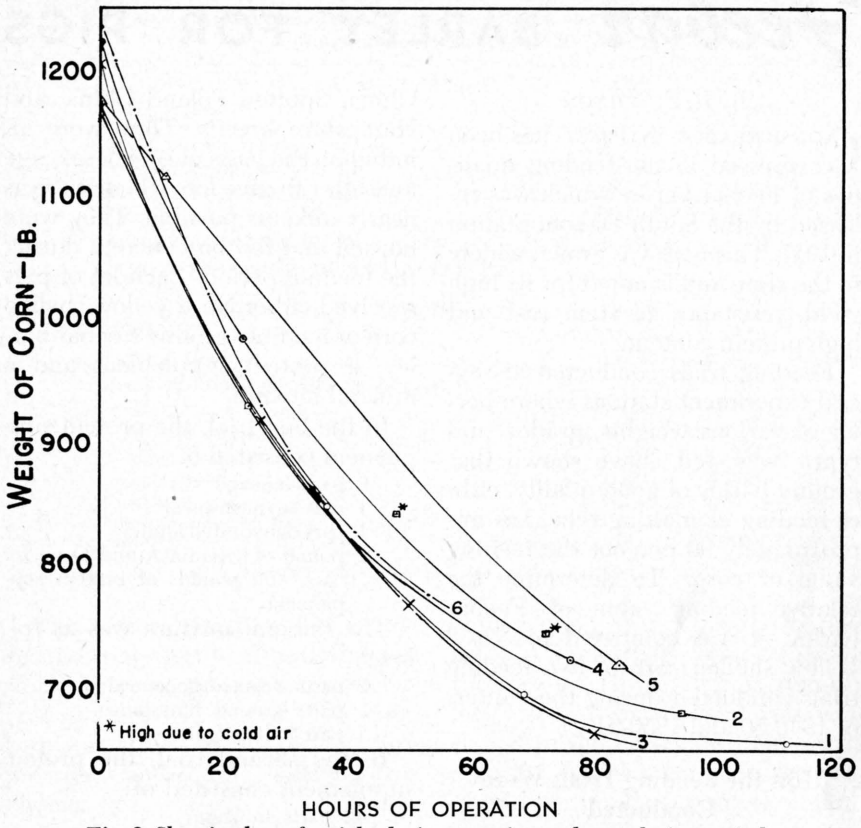


Fig. 2. Showing loss of weight during experimental corn drying periods

one field in this experiment produced corn which averaged 23.7 percent moisture. It also contained some very soft ears. Individual ear tests ran from 15 percent to 55 percent, with some ears of 30 percent moisture content in every load.

The crop dryer used was of the direct fired type, 7½HP moter, rated 16,500 cubic feet per minute at 1/2-inch static pressure, with dual burners that consumed 10 gallons of fuel oil per hour when set to run continuously. This dryer was operated a total of 15 hours (burner ran 13½ hours) on the following dates: Nov. 21, 24, 25, and Dec. 4 and 5. On these days the outdoor temperatures were uniform, varying from 25 to 42 degrees F. The burner raised temperatures in the crib inlet to above 150 degrees F.

For the 15 hours operation, 120 gallons of fuel were consumed at a cost of $16.80. Power cost for the 7½ HP motor, operating on 230V, was estimated at $2.10, figured at 2 cents per kwh. (A smaller motor is recommended for farm lines.)

At the close of the test, samples were obtained from the outside layers of corn and these tests averaged

Continued on page 101

Feebar BARLEY FOR PIGS

By R. F. Wilson

Considerable interest has been expressed in the feeding qualities of Feebar barley which was released by the South Dakota Station in 1947. This barley is grown widely in the state and is noted for its high yield, resistance to stem rust and high protein content.

Feeding trials conducted at several experiment stations where barley of various weights, grades and types was fed, have shown that ground barley of good quality, either feeding or malting type, has approximately 90 percent the feeding value of corn. To determine the relative feeding value of Feebar barley, it was compared to No. 2 yellow shelled corn in two feeding trials conducted during the winters of 1949-50 and 1950-51.

How the Feeding Trials Were Conducted

Ten pigs were fed in each of two lots from weaning to a final weight of approximately 225 pounds. These pigs were of the Duroc, Poland China, Spotted Poland China and Hampshire breeds. They were allotted on the basis of breed, sex, age and litter to give lots which were as nearly alike as possible. They were housed and fed on concrete during the feeding period. Each lot of pigs received either No. 2 yellow shelled corn or medium ground Feebar barley, a protein supplement and a mineral mixture.

In the first trial, the protein supplement consisted of:

- 2 parts tankage
- 1 part soybean meal
- 1 part dehydrated alfalfa
- 1 pound of vitamin A and D oil for each 400 pounds of protein supplement

The mineral mixture was as follows:

- 2 parts steamed bonemeal
- 2 parts ground limestone
- 1 part iodized salt

In the second trial, the protein supplement consisted of:

- 42 parts tankage
- 27 parts soybean meal
- 26 parts ground, sun-cured alfalfa hay
- 5 parts of a complex mineral mixture

Barley for years has been one of South Dakota's most dependable feed crops for pigs

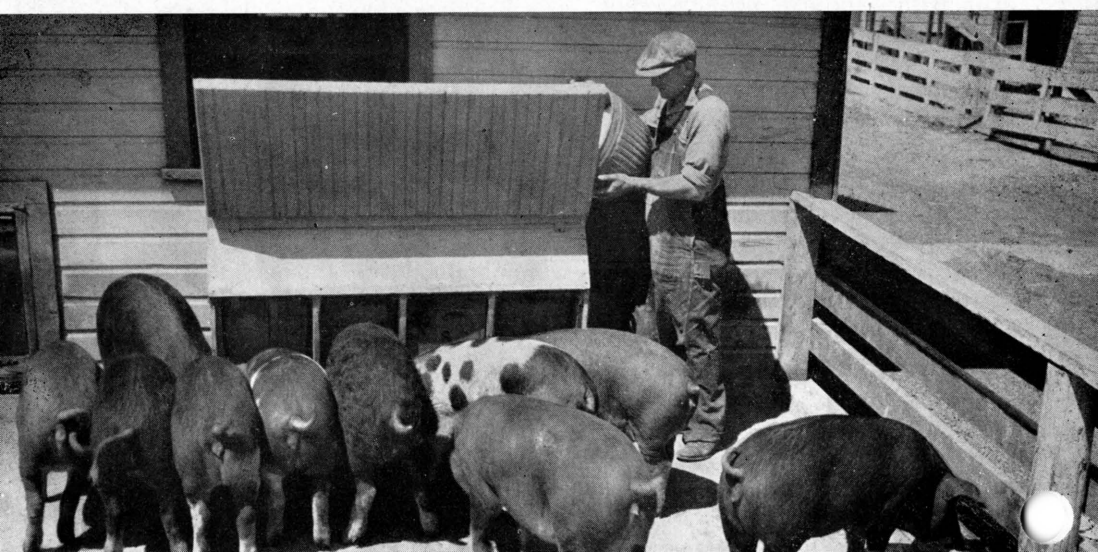


Table 1. Ground Feebar Barley Compared to Shelled Yellow Corn Summary of Results 1949-50

10 Pigs in Each Lot	Lot I Shelled Yellow Corn	Lot II Ground Feebar Barley
Average number days on test	103.0	113.0
Average initial weight, lbs.	55.2	53.4
Average final weight, lbs.	224.4	224.0
Average total gain, lbs.	169.2	170.6
Average daily gain, lbs.	1.64	1.51
Average daily feed consumed per pig, lbs.		
Grain	5.81	6.10
Protein supplement	0.70	0.57
Mineral	0.06	0.04
Total feed	6.57	6.71
Feed consumed per 100 lbs. of gain, lbs.		
Grain	354.3	403.9
Protein supplement	43.0	37.8
Mineral mixture	3.7	2.9
Total feed	401.0	444.6
Feed cost per cwt. gain*	$9.15	$10.34

*Feed prices used: shelled corn, $1.96 per cwt.; Feebar barley (ground), $2.08 per cwt.; tankage, $5.75 per cwt.; soybean meal, $4.40 per cwt.; dehydrated alfalfa meal, $3.70 per cwt.; vitamin A and D oil, $0.25 per pound; ground feeding limestone, $0.70 per cwt.; steamed bonemeal, $4.25 per cwt.; iodized salt, $1.55 per cwt.

The mineral mixture fed in the second trial was the same as that fed in the first except that a trace mineral mixture was added. This mixture was added to the protein supplement and also self-fed free choice.

The barley fed in the first trial had a test weight of 42 pounds per bushel while the corn tested 53.5 pounds per bushel. In the second trial, the corn tested 53 pounds per bushel with 13 percent moisture, and the barley, 45 pounds per bushel.

Feebar Compares Favorably with Other Good Quality Barleys

Greater daily gains were made by the pigs fed the shelled corn, although both lots made good daily gains (Table 1). There was very little difference in total feed required per hundred pounds of gain and in total feed eaten per pig daily. The daily consumption of grain per pig in the ground barley lot was somewhat greater than in the corn lot. However, considerably less protein supplement was consumed in the barley lot than in the corn lot. Consequently, in feed required per hundred pounds of gain, more grain and less protein supplement were required by the barley-fed pigs than by the corn-fed pigs. On the basis of total feed required for a hundred pounds of gain, the ground barley was worth 90 percent as much as the corn.

The feed costs per hundred pounds of gain given for both lots are largely dependent upon the prices paid for the feeds. In this trial, barley cost slightly more per pound than corn. The higher price paid for barley plus the greater requirement per unit of gain resulted in a feed cost of $1.19 more per 100 pounds of gain than for the lot fed shelled corn.

Continued on page 102

South Dakota . .

By John P. Johansen

South-central Nebraska is a pilot area in regard to irrigation in the easterly parts of the sub-humid Great Plains. South Dakotans who are concerned about the development of irrigation in the James River valley will be interested in observations about irrigation in this region of Nebraska. The area is located about 275 miles south and 75 miles west of Huron, South Dakota. In this region, irrigation is mostly a recent development which includes several types of enterprise and is in process of rapid extension. It may be called a pilot area because it shows the social and economic consequences which may be expected when irrigation is introduced in a long-established farming area. Here, irrigation differs, both in its characteristics and in its consequences, from irrigation developed under arid or semi-arid conditions.

This study is focused upon eight

(Left) **Irrigated cane, Huron Development Farm. Photo courtesy Bur. of Rec. Even a small boy can help irrigate a field of corn with siphon tubes from an elevated ditch, Republican City, Neb. SCS photo**

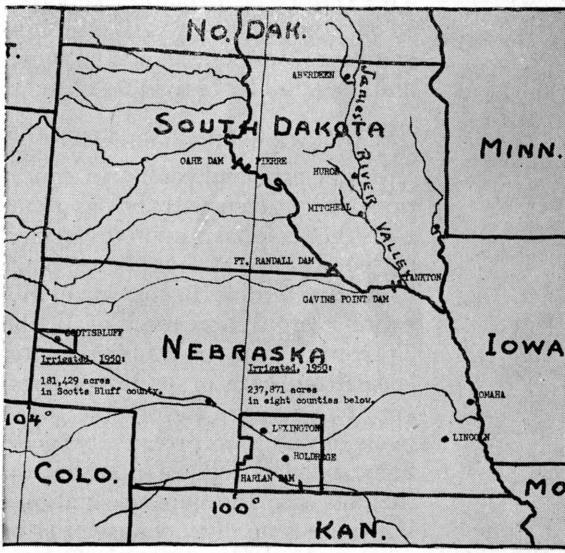
LOOKS AT IRRIGATION IN NEBRASKA

counties located in south-central Nebraska. Four of them—Dawson, Phelps, Kearney and Buffalo—have extensive irrigation, and the other four—Gosper, Furnas, Harlan and Franklin—have, as yet, very little irrigation. Scotts Bluff county located in the western part of Nebraska, has been included in order to make a comparison with an area that has developed an intensive system of irrigation.

The largest area of gravity irrigation in the eastern part of the Great Plains is that of the Tri-county system (which includes parts of Gosper, Phelps, and Kearney counties), also known as the Central Nebraska Public Power and Irrigation District. As its name implies, it is organized to generate hydro-electricity as well as to provide irrigation, and these two purposes involve also allied purposes of water storage and river flow regulation, and the development of recreational facilities on the reservoirs.

Central Nebraska is not an arid region. The average annual precipitation ranges from 20 to 26 inches. But the area is subject to frequent long droughts and poor crops in some years, while in others sufficient rainfall and good crops prevail. Irrigation in this area is largely an optional development which has been adopted because it has been found to result in increased crop

Location of the irrigation area in Nebraska, 275 miles S. and 75 miles W. of Huron



Electric motor turbine pump delivering 10,000 gallons per minute. SCS photo

yields, better rotations and more valuable farm production.

The irrigated land in the eight counties mentioned increased from 108,964 acres in 1940 to 237,871 acres in 1950. Land irrigated by Tri-county facilities increased gradually from 44,000 acres in 1942 (the first year of full-scale operations) to 91,477 acres in 1951. Since an ample supply of underground water is available at comparatively low depths in the river valley, irrigation by means of pumped wells has undergone a rapid expansion in Buffalo, Dawson and other counties. The census of irrigation reported 2,382 pumped wells in these eight counties. Most of them are owned and operated by individual farmers.

Irrigation is Semi-intensive

Under arid and semi-arid conditions, irrigation usually brings about a distinct emphasis upon diversified cash crops such as sugar beets, potatoes, dry edible beans, vegetable canning crops, and the like. In the Tri-county area, this emphasis upon specialized cash crops is not present. The acreage devoted to sugar beets or potatoes is relatively small. Some need is felt for a cash crop that fits into the current rotations, but there is no distinct answer as to what it should be. Instead of an intensive irrigation of diversified cash crops, there is an extensive application of water to corn and alfalfa and to some spring grains (oats or barley) which are used as nurse crops for legume seedings.

Where irrigation approaches the traditional type, it usually leads to a strong emphasis upon livestock which may be raised on the farm or purchased for feeding. Livestock strengthens the economy of irrigation by turning feed crops into more valuable livestock products, by furnishing a supply of fertilizer which is necessary to maintain soil fertility and by rounding out farm employment through the year.

In central Nebraska, irrigation still seems to consist of supplementary water applied as extensively as possible to one or two crops—corn and alfalfa—when they most need it in July or August. While the yields of irrigated crops in the Tri-county area are much better than the yields of non-irrigated crops, it is also true that irrigated yields in the Tri-county area are not as high as they could be if a better standard of irrigation was achieved—not only in regard to irrigation practices as such, but also in regard to the use of fertilizers, crop rotations, and the like. Briefly, irrigation in this region of Nebraska is semi-intensive.

Irrigation and the Size of Farms

The census of 1950 makes it possible to distinguish between wholly irrigated farms, partly irrigated farms and non-irrigated farms. A wholly irrigated farm is one in which all of the irrigated cropland was harvested. Other farms which irrigated some of their harvested cropland, but not all of it, are partly irrigated farms. The average size of these farms is given in Table 1.

In Central Nebraska, irrigation has not resulted in smaller farms. In Nebraska, generally speaking, and also in the Tri-county area, the average size of partly irrigated farms is a good deal larger than the average size of non-irrigated farms. In other

Table 1. Average Acres per Farm for Wholly Irrigated Farms, Partly Irrigated Farms and Non-irrigated Farms in Nebraska, the Tri-County Area and Scotts Bluff County, 1950

	Irrigated Farms		Non-irrigated Farms
	Wholly Irrigated Farms Acres	Partly Irrigated Farms Acres	Acres
All Land in Farms			
Nebraska	199.3	554.5	441.7
Tri-County Area	234.5	366.6	349.8
Scotts Bluff County	172.2	454.4	817.6
Cropland Harvested			
Nebraska	106.6	216.9	180.6
Tri-County Area	140.5	234.2	184.0
Scotts Bluff County	104.2	136.9	107.6

words, irrigated farming as a rule is combined with dry-land farming. In Scotts Bluff county where intensively irrigated farms prevail, the non-irrigated farms, which are usually large ranches, have a much larger average acreage. Since irrigation has been established a relatively short time in the Tri-county area, it remains to be seen whether the more intensive types of irrigated farming will make greater headway than the less intensive ones.

Influence of Irrigation on Population

The influence of irrigation upon population and farm settlement must be seen against the background of two general trends. First, a pronounced decline of the farm population has been caused by increased mechanization, which has displaced farm labor, and by the enlarging of farms, which has reduced the number of farms and farm homes. Secondly, there has also taken place a pronounced decline of population in the majority of villages and small towns. It is very significant, therefore, if irrigation can be shown to have had positive results upon population. Furthermore, in the Tri-county area the development of irrigation has probably not had a sufficient period of time so that its influence on population might become fully apparent.

Table 2. Percent of Increase or Decrease in the Farm and Non-Farm* Population in South-Central Nebraska Areas With and Without Irrigation, 1940 to 1950

Area or County	Percent Increase or Decrease(—) Whole Population	Non-farm Population	Rural-farm Population
Nebraska	0.7	12.5	—21.0
South-central Nebraska			
Four counties with extensive irrigation†	5.5	24.2	—18.8
Four counties without extensive irrigation‡	—7.9	14.4	—25.9
Scotts Bluff county	**0.1**	**14.0**	**—23.3**

*Non-farm population includes the urban and the rural-nonfarm population.
†Buffalo, Dawson, Kearney and Phelps.
‡Gosper, Franklin, Furnas and Harlan.

Town and Country Population Trends

The increase or decrease in the population of two groups of counties in south-central Nebraska is shown in Table 2; four counties *with* extensive irrigation and four *without* such irrigation. It is also possible to compare these areas with Scotts Bluff county and with the state of Nebraska. The four counties with extensive irrigation have had a considerably larger increase of the whole population and a considerably smaller decrease of the rural-farm population than were experienced either in the non-irrigated counties, or in Scotts Bluff county, or in the state as a whole. The basic figures, however, are county-wide and do not separate the influence of irrigation from other influences.

The increase of the non-farm population element was much greater in the four counties with extensive irrigation (24.2 percent) than in the adjoining four counties without irrigation (14.4 percent). This population includes (a) urban areas having 2,500 population or more and (b) the rural non-farm population, mostly composed of the smaller towns, villages and hamlets.

Many specific facts could be mustered to indicate the influence which irrigation has had upon villages, towns, and cities of the region. The county seats of Phelps, Kearney and Dawson counties experienced much larger population increases than trade centers of similar size elsewhere in the state. As to the smaller trade centers, distinct population increases occurred there also. While some of them had population reverses, it is rather significant that they held their own as well as they did considering the competition from the larger centers which they are subject to.

Table 3. Persons per Square Mile in the Rural-farm Population of Selected Counties

County	Person per Square Mile, 1950		
	Whole County	Irrigated Part	Non-Irrigated Part
Phelps	6.2	7.4	5.0
Kearney	6.1	8.0	5.5
Dawson	6.7	9.4	4.5
Scotts Bluff	13.4	18.7	1.6

Density of Farm Population

Large-scale maps of these counties were used showing the location of farmsteads. These were counted by sections within the irrigated and non-irrigated parts of each county. The rural-farm population was allocated to each area according to the proportion of all farm dwellings. By this method the estimated farm population residing in the irrigated area and in the non-irrigated area was obtained.

In Central Nebraska, there is a considerable difference in density of population between irrigated and non-irrigated areas. In Phelps county the difference is nearly 50 percent higher in the irrigated areas. In Dawson county there is a readily observed difference between the density of the irrigated valley and non-irrigated hills and tablelands. Under arid or semi-arid climatic conditions, the difference in density of settlement is very pronounced. Scotts Bluff county lost 23.3 percent of its farm population from 1940 to

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Good Records Will Show You Where the Farm is Making Money or Losing Money

By Allen Clark

Farm records for the past year show that the farmers in both north-central and southeastern South Dakota are definitely in a cash receipts-cost squeeze. In southeastern South Dakota, cash sales have gone down a little from the 1951 level and costs have gone up approximately one-half. Farm expenditures are rather uniform in their increase in almost all lines (Table 1).

Labor is in short supply and cost high; machinery is in plentiful supply but new machinery is still quite expensive. Secondhand machinery, however, has gone through a period of price adjustment and is somewhat lower than in 1951 or '52.

Livestock farmers did not fare quite as well in 1952 as did grain farmers because of the support prices for grain; cattlemen, in particular, have suffered because of the combination of a dry year, heavy cattle marketing, and a one-third decline in cattle price.

A Fieldman Suggested

The South Dakota Farm and Ranch Record research project has been in constant operation since

Table 1. A Comparison of Total Cash Sales and Total Cash Expenses on Record-Keeping Farms in North Central South Dakota, 1951-52

	1951			1952		
	Average of 52 Farms	Average of 12 Most Profitable Farms	Average of 12 Least Profitable Farms	Average of 52 Farms	Average of 12 Most Profitable Farms	Average of 12 Least Profitable Farms
Total cash sales	$15,175	$23,693	$12,377	$14,374	$16,769	$12,878
Total cash expense	6,766	8,787	5,291	10,337	12,272	10,939
Net cash income	8,409	14,906	7,086	4,037	4,494	1,939

1942. One of the present difficulties in this project is that of obtaining reliable data, both for the farmer's managerial decisions and for research purposes. Perhaps an answer to this is the type of project that is in operation in a number of other states. These states have a system in which farmers form an association and hire a fieldman who lives right in their area and works with them on farm record problems. The fieldman also prepares the farmer's income tax reports as a part of his job.

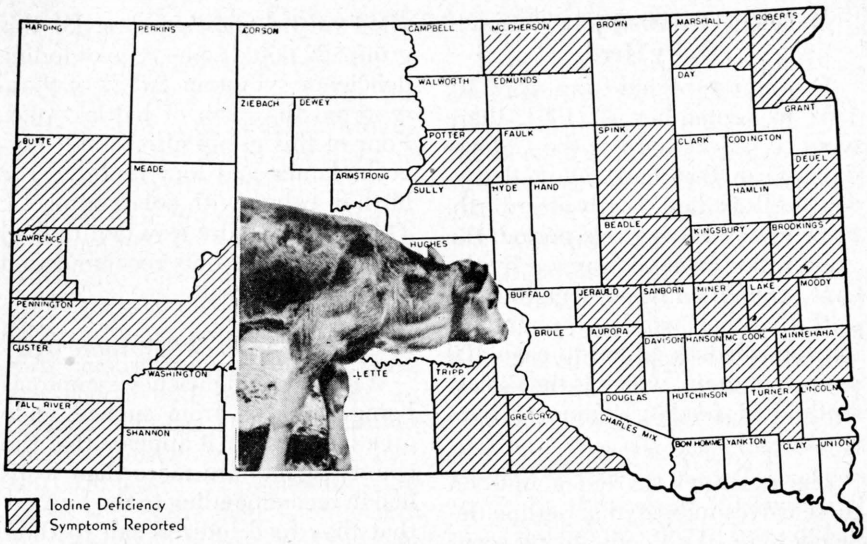
A fieldman will give the farmer help with his record work and insure a complete accounting of expense and income items. By helping with the accounting, he also will be in a position to suggest management changes which will increase the farmer's income.

Farm Record Farmers Above Average for Area

When the Farm Record project was started in the north central area of the state, a representative sample of farmers was selected by the county agent and the FHA supervisor. There were some outstanding farmers, many average farmers, and some below average in farming ability. At the present time, the farmers in the association are all superior farmers. There are two reasons for this change: one is that during the early years, the very poor farmers dropped out of the association. They either "did not have time to keep records" or they were dissatisfied with their standing in the group and so dropped out. The so-called "average" farmers have changed rather radically. Some of them have dropped out, those remaining have taken the lesson shown by their farm records and improved their management to the point where they are now well above average for their area.

Several Years' Records Needed

A good set of records will show where the farm is making money and where it is losing. When this is down in black and white, it usually makes it easier to adjust so that more time and effort are being spent in enterprises that are making money and less on enterprises that are either breaking even or losing money. However, several years' records are needed in order to do an accurate and profitable job of adjusting farm practices. Unusual price situations or unusual weather situations may cause the enterprise to shift from profit to non-profit. It is the long-time result that farmers are most interested in. (Project 137. Leader: Allen Clark, Agricultural Economics Dept.)



An iodine deficiency in livestock results from a lack of this element in the soils

'Big-Neck' IN CALVES

By CHASE WILSON

COWS ON RATIONS deficient in iodine may give birth to weak, goitrous (often called big-neck) calves. Most such calves are alive at birth, although a few may be still-born. Some are weak and die within a few days; others have approximately normal vigor and are not noticeably affected except for enlargement of the thyroid which may or may not cause difficult breathing because of pressure on the windpipe. If the calf is able to take nourishment, the goiter frequently diminishes in size until it is no longer noticeable, but sometimes it remains throughout adult life. In severe cases, the hair of the calf may be thinner than normal or the animal may be almost hairless.

Ewes receiving insufficient iodine also may give birth to weak lambs which often show thyroid enlargement (big neck) and may be partially woolless. The death rate among such lambs is very high.

Sows may give birth to weak pigs which are often more or less hairless and may be still-born or die within a few hours. Some of the pigs in a litter may be more seriously affected than others.

An iodine deficiency in livestock results from a lack of this trace element in the soils. Crops raised on these soils make normal growth, but when livestock eat these crops the deficiency manifests itself in the form of goiter and in reproductive disturbances and growth failures.

Deficiency Shows Up in Station Dairy Herd

During the period from April 10, 1951 to September 17, 1951, there were six calves born at the College dairy farm that had enlarged thyroids. All six died shortly after birth. Prior to and during this period, the grain ration being consumed by the cows contained 1 percent iodized salt. In other words, 1 pound of iodized salt was added to each 100 pounds of grain, which is the easiest method of feeding iodine to livestock.

The enlarged thyroid glands on these calves indicated an iodine deficiency in the feeds being consumed by their mothers. The oversized glands ranged from a slight enlargement up to nearly 30 times as large as normal. One enlarged thyroid weighed 305.8 grams. This is in contrast to about 10 grams for a normal one. At the time when these abnormal calves were being born, the percentage of iodized salt in the grain ration of the cows was increased from 1.0 to 1.5. Since then, there have been no more calves born with enlarged thyroid, and no deaths resulting.

Survey of State Made

As a result of this experience, the Dairy department made a survey of the state with respect to iodine deficiency. A questionnaire was sent to each county agricultural agent asking whether iodine deficiency symptoms in livestock had been reported in the county. Symptoms asked for were "big-neck" in either lambs or calves, or the birth of hairless pigs.

A total of 51 county agents replied to the questionnaire. Of this group, 22 noted some type of iodine deficiency symptom. All 22 of these reported the birth of hairless pigs. Four of this group also found "big-neck" lambs and four reported the birth of calves with enlarged necks. This questionnaire revealed that 44 of the county agents recommended feeding iodized salt.

Percent of Iodized Salt Increased

With iodine deficiency symptoms being reported from such a wide area in the state, it appears that the county agents are more than justified in recommending to the farmers that they feed iodized salt to their livestock. Minimum amounts of iodine required for the growth and reproduction of farm animals have not been determined specifically for these areas. However, if iodized salt is fed free-choice to livestock, they will govern their intake in such a manner that they will be receiving an adequate amount of iodine. This is the most practical means of feeding it to livestock on a low grain intake.

It may be fed either in the form of block-salt or as loose salt in a trough. In the case of livestock eating larger quantities of grain, the iodized salt should be added to the grain ration. This will insure that each animal gets the required amount. It would seem that a rate of feeding iodized salt at 1½ percent of the total grain should take care of the minimum iodine requirements of South Dakota livestock. This is about one-half percent higher than is generally recommended in other areas. (Project 184. Leader: Chase Wilson, Dairy Dept.)

South Dakota Looks at Irrigation

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1950. Even so, it has probably the highest number of farm inhabitants per square mile found any place in the state of Nebraska.

Density of population is one of the fundamental conditions of social institutions. The density of the rural population influences such things as country roads, mail routes, rural electrification, country churches, schools and high schools. In Scotts Bluff and Dawson counties one may observe many of the best and strongest rural schools, compared with such schools elsewhere in Nebraska. These schools are strong both socially and financially because they have a sufficient number of children to employ two or more teachers and they have the taxable wealth necessary to assure support. In certain localities of Phelps and Kearney counties there are now thriving country churches. They were established long ago by early pioneers but have been revitalized by influences that stem from irrigated farming.

Irrigation has made headway in south-central Nebraska. It has resulted in better crop yields and more assured agricultural production. It has made for an increase of population in communities where it has been developed. Several types of irrigation enterprises are in use, each with its own advantages and disadvantages. They are all of an optional nature, and they must produce satisfactory results if they are to gain ground. This situation implies also that the basic decision to irrigate or not to irrigate must be made by the farmers, individually or as an organization. The choice is theirs.

These and many other points may be learned from a study of irrigation in this region of Nebraska and they are suggestive with respect to the future of irrigation in the James River valley. (Project 222. Research conducted by the South Dakota Agricultural Experiment Station in cooperation with the Bureau of Reclamation, USDI. Leader: J. P. Johansen, Rural Sociology Dept.)

Drying the Corn Crop

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17 percent moisture. It was not possible to get tests of corn next to the inlet air passage with the grain probe, but it has been shown in other tests that this corn would be several percent drier. The drying efficiency was not particulary high, but it should be remembered that much of the corn was mature and dry, with only part of the corn of high moisture content. At times, the moisture movement out of the crib was noticeable when steam would condense in the cool air just outside.

Six tests were run indoors to determine drying rates under controlled conditions, using equipment where actual water loss could be noted. Figure 2 shows the drying rate of these trials. (Project 152. Leader: H. H. DeLong, Agricultural Engineering Dept.)

Feebar Barley For Pigs

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In the second trial (Table 2) somewhat less daily gain was made by both lots of pigs than in the first trial. The corn-fed pigs made slightly greater daily gains, consumed less grain and more protein supplement than the barley-fed pigs. Also, in feed required per hundred pounds of gain, more grain and less protein supplement were required by the barley-fed pigs than by the pigs receiving the shelled corn. The approximate feeding value for the barley, in terms of total feed required per hundred pounds of gain, was 88 percent that of shelled corn. On the basis of feed cost per hundred pounds of gain, the ground barley lot again showed the highest feed cost.

It is of importance that somewhat more waste occurred in the lots fed the ground barley than in the corn-fed lots. More Feebar barley was required than corn for the same gain but the protein supplement consumed with the barley was less as compared to that consumed with the corn. However, the saving in protein supplement was not sufficient to offset the greater cost of the barley. The low intake of protein supplement is true of most feeding trials where barley is compared to corn. In the chemical analysis made of the grains fed in this experiment, the barley was 3 percent higher than corn in crude protein in the first trial and 2 percent higher in the second. This is typical of barleys in general. (Project 85. Leaders: R. F. Wilson and R. C. Wahlstrom, Animal Husbandry Dept.)

Table 2. Ground Feebar Barley Compared to Shelled Yellow Corn
Summary of Results 1950-51

10 Pigs in Each Lot	Lot I Shelled Yellow Corn	Lot II Ground Feebar Barley
Average number days on test	128.8	131.6
Average initial weight, lbs.	43.2	43.2
Average final weight, lbs.	223.0	225.0
Average total gain, lbs.	179.8	181.8
Average daily gain, lbs.	1.40	1.38
Average daily feed consumed per pig, lbs.		
Grain	4.84	5.75
Protein supplement	0.60	0.37
Mineral	0.01	0.01
Total feed	5.45	6.13
Feed consumed per 100 lbs. of gain, lbs.		
Grain	346.7	416.0
Protein supplement	42.8	26.6
Mineral mixture	0.8	0.9
Total feed	390.3	443.5
Feed cost per cwt. gain*	**$11.03**	**$12.78**

*Feed prices used: shelled corn, $2.68 per cwt.; Feebar barley (ground), $2.81 per cwt.; tankage, $5.50 per cwt,; soybean meal, $4.25 per cwt.; alfalfa hay (ground), $1.50 per cwt.; ground feeding limestone, $1.30 per cwt.; steamed bonemeal, $5.25 per cwt.; iodized salt plus trace mineral mixture, $2.20 per cwt.

AGRONOMY FIELD DAY Notes - JULY 7, 1953

Farmers fumbled the ball on their oat crops this year. Conditions were right for a bumper crop of oats, yet many have stunted stands only 8 inches tall. Why? No fertilization, says Dr. Leo Puhr. Oats are a nitrogen-hungry crop. They need about 20 pounds of nitrogen an acre and 20 pounds of phosphoric acid (100 pounds of 20-20-0). That's only one bag of fertilizer per acre, Puhr says.

Best for South Dakota

Two new oat varieties will be released this year, one for the eastern and one for the western part of the state, V. A. Dirks announced.

Out of a nursery of some 300 flax varieties, four are recommended for yield and resistance to disease. These are Sheyenne, Redwood, Marine and B-5128.

U. J. Norgaard, extension agronomist, says that 10 counties produce about 75 percent of the flax in South Dakota, and another 10 counties produce about 80 percent of the winter wheat. It is the object of plant breeders at the Station to breed a winter wheat variety that will be adapted to most of the areas of the state—a big program, comments U. J. Of the winter wheats now available, Nebred and Minter are outstanding.

For spring wheat, Rushmore has more tolerance to stem rust than any other commercial variety.

Outstanding and most winter hardy rye variety is Pierre, developed at the Station. Rye is one of the surest producing crops, as it is adapted to every county in the state. It is a good weed fighter and makes good pasture.

Of all the grasses tested, Ree wheatgrass is the outstanding yielder throughout the state, Dr. J. G.. Ross tells us. Bromegrass runs it a close second. The reason Ree has not been too commonly grown is that seed production is difficult in this state, with a resulting high cost. As for the bromegrasses, there is very little difference in yield among the varieties. Better yields are obtained when brome and alfalfa are grown together than when either are grown alone.

If you want to keep alfalfa 3 to 5 years, grow a wilt resistant variety. One of the best the Station has to recommend is Ranger alfalfa. For shorter rotations, where wilt does not get a chance to show up too much, Ladak and Cossack are O.K.

Kill the Weeds but not the Crop

To answer countless questions from farmers on chemicals which are on the market for weed control, the Station has experimented on small grains and corn. Flax was sprayed with 2,4-D, MCP, 3,4-D, TCA and 4D. According to Dr. L. Derscheid in charge of the experiment, MCP and TCA did not hurt the flax (TCA injured corn severely, however) 2,4-D delayed flowering three or four days on flax, and 3,4-D and 4D hurt yields.

Oats Blast Common in State

Dr. C. M. Nagel, plant pathologist, says that oat blast (empty seed hull) is not a disease organism and does not carry over in the seed. It occurs in either extremes of high soil moisture or dry soils.

Testing pasture yields month by month and also measuring gains in weight made by Hereford steers, in a project conducted by the agronomy and animal husbandry depts.

Rust Control With Chemicals

Until resistance to 15B is found in new varieties, other measures may help, says Dr. G. Seminiuk, plant pathologist. A new approach to rust control on small grains is undergoing trial by the Plant Pathology department. Demonstration plots were shown where control has been attempted by spraying with systemic fungicides (absorbed in plant's system). Although it is too early to tell for certain, there is evidence that control is obtained from the use of the sulfamate fungicides.

A Complete Pasture Program

One the best set-up and supervised pasture programs in the country was on display for the first time to visitors at the Field Day. It is designed to test pasture yields month by month and to measure gains in weight made by steers on these pastures. G. T. King of the Animal Husbandry department and Dr. W. W. Worzella of the Agronomy department are cooperating on this experiment. Twelve 4-acre paddocks contain three common types of pasture — brome, alfalfa-brome and sweet clover and rye, grown in duplicate on soil typical for eastern South Dakota.

By finding out how these three common pastures produce, the Station will be able to help the farmer plan a pasture program that will give him good forage throughout the grazing season.